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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/517,818	12/14/2004	Suk Hun Lee	3449-0413PUS1	8713

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EXAMINER	
INGHAM, JOHN C	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 11/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/517,818	LEE, SUK HUN	
	Examiner	Art Unit	
	John C. Ingham	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 September 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/27/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. The drawings were received on 11 September 2006. These drawings are accepted. The amendments to the abstract, specification, and claims have been entered.

Claim Objections

2. Claim 1 is objected to because of the following informalities: The claim identifier reads "Original" although there is an amendment made. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims **1-6, 10-13, 16-17 and 20** are rejected under 35 U.S.C. 102(b) as being anticipated by Takashi (IDS filed 27 September 2006, JP 20010274096, English translation is attached and referenced).

6. Regarding claims **1, 6 and 11**, Takashi discloses in the abstract figure a nitride semiconductor LED, comprising: a substrate (1); a GaN-based buffer layer (2, 3 and 30) formed on the substrate; AlGaN/GaN short period superlattice layers (40, may be AlGaN/Gan as described in ¶11) formed on the GaN based buffer layer in a sandwich structure of upper and lower layers having an indium doped GaN layer (as described in ¶15) interposed therebetween; an first electrode layer of an n+ GaN layer (7, contact layers are highly doped for conductivity) formed on the upper SPS layer; an n-GaN layer (10) formed on the first electrode layer and containing a low concentration of dopants (guide layers doped lower for bandgap); an active layer (11) formed on the first electrode layer; and a second electrode layer (15) of a p-GaN layer formed on the active layer.

7. Regarding claims **2 and 10**, Takashi discloses the LED of claims 1 and 6, wherein the GaN buffer layer (2, 3 and 30) has a triple-structured AlGaN/InGaN/GaN laminated (¶52).

8. Regarding claim **3**, Takashi discloses the LED of claim 1, further comprising the undoped GaN layer (4) on the GaN based buffer layer (2, 3 and 30).

9. Regarding claims **4 and 5**, Takashi discloses in the abstract figure a nitride semiconductor LED, comprising: a substrate (1); a GaN-based buffer layer (2, 3 and 30) formed on the substrate, wherein the GaN buffer layer has a triple-structured

AlGaN/InGaN/GaN laminated (¶52); an undoped GaN layer (4) on the GaN based buffer layer; AlGaN/GaN short period superlattice layers (40, may be AlGaN/Gan as described in ¶11) formed on the GaN based buffer layer in a sandwich structure of upper and lower layers having an indium doped GaN layer (as described in ¶15) interposed therebetween; an first electrode layer of an n+ GaN layer (7, contact layers are highly doped for conductivity) formed on the upper SPS layer; an n-GaN layer (10) formed on the first electrode layer and containing a low concentration of dopants (guide layers doped lower for bandgap); an active layer (11) formed on the first electrode layer; and a second electrode layer (15) of a p-GaN layer formed on the active layer.

10. Regarding claims **12 and 13**, Takashi discloses a fabrication method of a nitride semiconductor LED, comprising: a growing up a GaN-based buffer layer (¶51) on a substrate; forming $Al_yGa_{1-y}N$/GaN short period superlattice layers on the GaN based buffer layer in a sandwich structure of upper and lower layers having an indium-doped GaN layer interposed therebetween (¶54); forming a first electrode layer of an n+-GaN layer (¶84) containing a high concentration of dopants (inherent in a contact layer) on the upper SPS layer; forming an n-GaN layer (layer 10, ¶84) containing a low concentration of dopants (inherent in guide layers) on the electrode layer; forming an active layer (¶84) on the n-Gan layer; forming a second electrode layer of a p-GaN layer on the active layer (¶86).

11. Regarding claim **16,** Takashi discloses the fabrication method of claim 12, wherein the GaN buffer layer (2, 3 and 30) has a triple-structured AlGaN/InGaN/GaN laminated (¶52).

12. Regarding claim **17**, Takashi discloses the method of claim 12, further comprising the step of forming an undoped GaN layer (4) on the GaN based buffer layer (2, 3, 30).

13. Regarding claim **20**, Takashi discloses the method of claim 13, wherein the n-GaN layer (10) is formed with a semi-insulating layer (9, clad layer).

14. Claims **6-9** are rejected under 35 U.S.C. 102(e) as being anticipated by Emerson (US 6,958,497).

15. Regarding claims **6-9**, Emerson discloses in Fig 1 a nitride semiconductor LED, comprising: a substrate (10); a GaN based buffer layer (11, AlGaN) formed on the substrate; a first electrode layer (12) of an n+ GaN layer formed on the GaN based buffer layer and containing a high concentration of dopants ($5x10^{18}$ cm^{-3}); an n-GaN layer (16) formed on the first electrode layer and containing a low concentration of dopants (average doping of $1x10^{17}$ cm^{-3}); an active layer (18) formed on the n-GaN layer; and a second electrode layer (32) of a p-GaN layer formed on the active layer.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. Claims **14 and 15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Takashi in view of Yuasa (US 6,017,774).

18. Regarding claim **14,** Takashi discloses the method of claim 12, wherein the layers are grown to a 50-400Å thickness (¶34) at 800°C (¶70), but does not specify that the GaN buffer layer is formed using MOCVD equipment in an atmosphere having H_2 and N_2 carrier gases supplied while having TMGa, TMIn, TMAl source gas introduced and simultaneously having NH_3 gas introduced.

Yuasa teaches the formation of nitride films using MOCVD equipment at a growth temperature of 800°C (col 13 ln 66) in an atmosphere of H_2 and N_2 carrier gases supplied while TMGa and NH_3 are introduced simultaneously (col 13 ln 33). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Yuasa on the method of Emerson since the teachings produce a nitride film with good growth efficiency relative to the material supply amount (col 10 ln 20-23).

19. Regarding claim **15**, Takashi in view of Yuasa teach the method of claim 12, wherein the GaN buffer layer is grown with a 100 torr growth pressure (Yuasa col 9 ln 7), but does not specify that the flow rate of TMGa as between 5-300μmol/min. However the rate would have been obvious to an ordinary artisan since the flow rates of carrier gases in crystal growth apparatuses are changeable, and this range is known in the art (e.g. Hatano col 11 ln 31-41 describes flow rates of materials in the manufacture of LEDs). Furthermore, the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another

variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990).

20. Claims **18 and 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over Takashi and Koide. Takashi discloses the method of claim 12, but does not specify wherein the dopant concentration of the n+ GaN layer (7) is more than $1x10^{18}/cm^3$ or wherein the dopant concentration of the n-GaN layer (10) is $1x10^{17}/cm^3$.

Koide teaches that the dopant concentration of the n+ GaN contact layer in an LED is more than $1x10^{18}/cm^3$ (¶48) and the dopant concentration of the n-GaN clad layer is approximately $1x10^{17}/cm^3$ (¶48). It would have been obvious to one of ordinary skill in the art at the time of the invention to use these values since these values are well known in the art. The high dopant concentration is known and improves conductivity of the n+ GaN contact layer, while the low dopant concentration is also known and improves the band gap of the n- GaN clad layer (e.g. Hatano col 8 ln 20 describes dopant relationship to resistance in LEDs).

Response to Arguments

21. Applicant's arguments, see pages 13-15 of Remarks, filed 11 September 2006, with respect to the rejection(s) of claim(s) 1-5 and 16-20 under 35 USC §102(e) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn.

However, upon further consideration, a new ground(s) of rejection is made in view of Takashi.

22. Applicant's arguments regarding claims 6-9 have been fully considered but they are not persuasive. Emerson pertains to Group III-V based LED structures and describes the structure as claimed in claims 6-9, which do not specify AlGaN or super-lattice structures on a buffer layer.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John C. Ingham whose telephone number is (571) 272-8793. The examiner can normally be reached on M-F, 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

John C Ingham
Examiner
Art Unit 2814

jci

HOWARD WEISS
PRIMARY EXAMINER